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What's Happening with Internet Use in Alberta Schools?

Data on Internet use in public and separate schools in Alberta were gathered from principals and teachers using a Likert-scale questionnaire and chi-square testing for significance. Respondents were motivated to learn to use the Internet primarily by personal interest, and trial and error was the most frequently reported approach to learning about the Internet. Principals were more positive than teachers about the adequacy of school and district support for Internet use. Principals used the Internet mostly for e-mailing colleagues and for accessing district and ministry information, whereas teachers used it mostly for finding instructional materials. Fewer than 40% of the teachers engaged their students in Internet use for more than one hour a week. The respondents were evenly divided between experienced and novice users. Users differed mainly on the nature and amount of their Internet use.

Des données sur l'emploi que l'on fait de l'Internet dans les écoles publiques et privées en Alberta ont été recueillies auprès des directeurs d'écoles et des enseignants à l'aide d'un questionnaire basé sur une échelle de Likert et de tests du chi-carré pour en mesurer la signification. Les répondants ont indiqué que c'était l'intérêt personnel qui les motivait à apprendre à se servir de l'Internet et ont répondu que l'apprentissage par essai et erreur constituait leur approche privilégiée d'apprentissage. Les directeurs d'écoles se sont avérés plus positifs que les enseignants quand à l'appui que l'école et le district apportaient à l'emploi de l'Internet. Les directeurs d'écoles profitaient de l'Internet pour communiquer par courrier électronique avec leurs collègues et pour puiser de l'information auprès du district et du ministère, alors que les enseignants s'en servaient surtout pour trouver du matériel pédagogique. Moins de 40% des enseignants ont indiqué qu'ils faisaient travailler leurs élèves à l'Internet pendant plus d'une heure par semaine. Parmi les répondants, il y avait autant d'utilisateurs débutants que d'utilisateurs avancés. Les utilisateurs se distinguaient surtout par la nature et la quantité de l'utilisation qu'ils faisaient de l'Internet.

Introduction

For the last two years in Alberta, initiatives such as provincial government funding of access to the Internet in schools and the development of the TELUS Learning Connection Internet training program have been encouraging schools to get connected to the Internet. These initiatives have provided an excellent opportunity for studies of the growth of Internet use in Alberta schools. The study reported here is only one phase of a long-term research program examining Internet use in schools and the factors that facilitate and

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limit that use. The results of this survey of principals and teachers in schools across Alberta indicated that the trends evident in the two qualitative studies conducted before the survey in six school sites in the Edmonton area were consistent with the experiences of principals and teachers across the province.

Related Literature

Little research addressing Internet use in education currently exists. The research that has been done to date suggests that the benefit to students of using new technologies such as the Internet is greatly dependent on the technological skill of teachers and their attitude to the presence of the technology in teaching (Grégoire, Bracewell, & Laferrière, 1996; Peha, 1995). Other factors influencing effective use of the Internet include the availability of sophisticated technology in terms of hardware and software (Maddux, 1994); the support for teacher learning (Hack & Smey, 1997; Honey & McMillan, 1993; Woodrow, 1991); and the adoption of new models of teaching and learning (Follansbee et al., 1996). The use of the Internet can change teachers' attitudes toward the computer as an instructional tool and can encourage them to restructure their classes; however, continued and effective use requires ongoing training, technical support, home access, and time to learn how to incorporate it into teaching (Gallo & Horton, 1994; Honey & McMillan, 1993). Factors that characterize the Internet, such as ambiguity, unpredictability, lack of structure, lack of selectivity, and variable information quality, have been found to contribute to the intricacy of the Internet as a learning environment for teachers (Todd, 1996). Computers, and the Internet specifically, place demands on schools in terms of infrastructure development and teacher learning, and schools and teachers need time to address these demands. The research literature suggests a five-year implementation period for any major change of this nature (Fullan, 1991).

Previous Phases of the Internet Research Project

The design of the questionnaire used in the study reported here was based on the findings of qualitative studies completed earlier by the co-investigators. Beginning in January 1997, a case study approach was used to collect data on how six schools from the K-12 sector were using the Internet and how teachers were learning to use it, as well as data on perceptions of its value as an educational tool (Gibson & Oberg, 1997). The findings from these case studies were reported under four themes, including perceptions of educators and parents of the value of the Internet, the use of the Internet by educators and students, knowledge of and training in Internet use, and the impact of the school context on Internet use. Overall, it was clear that the teachers, no matter what their experience level with the Internet, were frustrated by the vast amount of information available and their lack of search skills and strategies for dealing with it (Gibson & Oberg, 1998a).

In the second phase of the research, beginning in September 1997, one teacher in each of the six earlier schools was involved in a research partnership with a graduate student to examine ways to improve the teacher's research skills and integrate the Internet into instruction (Gibson & Oberg, 1998b, 1998c). Findings from Phase Two related to teacher learning and the use of the Internet included the need for accessible and timely professional development activities, especially those involving school-based, collaborative, collegial sup-

port; the importance of relevance to teaching for teacher interest and motivation; and the need for time to learn, to practice, and to reflect.

Methodology of the Internet Use Survey

In March 1998, as a third phase of our long-term study, survey questionnaires were mailed to 297 schools from K-12 in Alberta. The sample was generated from an alphabetic listing of Alberta Education's operating schools for the 1997-1998 school year. In the selected schools three educators were surveyed: an administrator and two classroom teachers. The questionnaire package was mailed to the principal, who was asked to have the surveys completed by an administrator in the school, by a teacher who was an experienced Internet user, and by a teacher who was a beginning Internet user. Postage-paid, addressed return envelopes were provided for each of the survey respondents.

The computer-scorable questionnaires consisted of 72 items, including Likert-scale rating items and yes-no items. Participants were asked to provide data related to the size of the school; the nature of the school community; their educational background and work experience; and their Internet knowledge, access, and use. Survey data were computer-scanned and analyzed using SPSS 6.1 version 8.0.

In this report of the findings, demographic data are reported in percentages. Responses to Likert-scale rating questions have been collapsed from a five-point to a three-point scale. For example, the *Never* and *Rarely* responses and the *Frequently* and *Regularly* responses have been combined from the scale *Never/Rarely/Sometimes/Frequently/Regularly.* This approach was used because these response pairs are conceptually similar and because the number of missing cases from a five-point scale would preclude valid chi-square testing for significant difference. Only significant differences at the $p<.001$ are reported here. This conservative p value is being used because of the multiple comparisons that were completed; this should have minimized Type I error rates in the analysis.

Summary of Survey Responses

Respondent Demographics

Responses were received from 166 administrators and 300 teachers. The 466 responses, out of a possible 891 responses, represent an overall response rate of 52%. Generally, the respondents and their schools appear to be representative of teachers and schools in Alberta based on comparisons with published statistics available from Alberta Education (see Table 1).

The respondents appear to be typical of Alberta's teaching force. In 1998 Alberta's educators had an average age of 41.01 years and an average of 14.97 years of teaching experience. Most of the survey respondents were in their 40s and had 15 or more years of experience in education. However, principals and teachers under 40 years of age and with less than 15 years of experience in education were slightly overrepresented, as were male teachers. The higher representation by those under 40 may reflect the higher confidence with technology of younger educators. The higher representation of males may reflect gender patterns in the teachers' choice of specialization involving computers and/or administrator selection of survey participants.

Table 1
Comparison of Respondent Demographic Data to Demographic Data of Alberta Schools[1]

		Survey Respondents		*Alberta Schools*	
		#	%	#	%
No. of schools		166	100%	1,708	100%
School type	Elementary	60	36%	696	41%
	Secondary	41	25%	377	22%
	Combined	56	34%	635	37%
	No response	9	5%	-	-
School size	≤500 students	136	82%	1,410	83%
	>500 students	30	18%	298	17%
Age of principals	<40	43	27%	147	10%
	≥40	118	72%	1,263	90%
	No response	2	1%	-	-
Age of teachers	<40	144	48%	11,096	45%
	≥40	148	49%	13,816	55%
	No response	8	3%	-	-
Gender of principals	Male	111	68%	948	67%
	Female	47	29%	462	33%
	No response	6	4%	-	-
Gender of teachers	Male	122	41%	7,709	31%
	Female	168	56%	17,204	69%
	No response	10	3%	-	-
Years in education of principals	≤ 15	37	22%	180	13%
	> 15	125	76%	1,230	87%
	No response	2	1%	-	-
Years in education of teachers	≤ 15	127	42%	14,147	57%
	>15	161	54%	10,767	43%
	No response	12	4%	-	-

[1]Alberta Education, 1997b.

The administrators responding to the survey were mostly men in their 40s with more than 15 years experience in education. The teachers were mostly women in their 40s with more than 15 years experience in education. There appeared to be no under- or overrepresentation of schools at particular grade levels in the survey responses. Survey responses were received from a similar portion of schools at particular grade levels: 11% of Alberta's elementary schools, 11% of schools serving both elementary and secondary students, and 9% of the secondary schools.

Survey Findings

The survey findings are reported here, organized according to key themes identified in the first two phases of the research program: access to Internet

Table 2
Chi-square Tests Comparing Teacher Internet Use for Planning and Preparation and Internet Access Location.

Internet access locations for teachers using the Internet >5 hours per week for planning and preparation	*N*	χ^2	*df*
Hookups in the classroom	280	34.52*	3
Hookups in a computer lab	282	7.24	3
Hookups in an open space	255	3.39	3
Hookups in the library	283	9.35	3
Hookups in the main office	271	8.02	3
Hookups in the teachers' workroom	268	19.59*	3

Note. *Values significant at $p<.001$.

connections; learning to use the Internet; uses of the Internet; support for and obstacles to that use.

Teacher Access to Internet Connections

Access to Internet connections is a necessary prerequisite for use; however, access location can influence levels of use. In this survey, teachers reported having access to Internet hookups in a computer lab (69%), in the library (67%), in the school's main office (48%), in their classrooms (46%), and in teacher workrooms (36%). Chi-square tests of association were done to test the association between the variable *use of the Internet for preparation and planning*, and the variable *Internet access location.* Teachers reporting high use of the Internet for lesson preparation and planning were more likely to have access to Internet connections in their classrooms (χ^2 (3, N=280) = 34.52, $p<.001$), and in teacher workrooms (χ^2 (3, N=268) = 19.60, $p<.001$), but not in computer labs (χ^2 (3, N=282) = 7.24, $p>.001$), or in the library (χ^2 (3, N=283) = 9.35, $p>.001$). Teachers' use of the Internet with their students was positively and significantly correlated to access to Internet connections in their classrooms (χ^2 (3, N=273) = 26.87,

Table 3
Chi-square Tests Comparing Teacher Use of Internet with Students and Internet Access Locations

Internet access locations for teachers using the Internet >5 hours per week with students	*N*	χ^2	*df*
Hookups in the classroom	273	26.86*	3
Hookups in a computer lab	275	18.34*	3
Hookups in an open space	245	5.50	3
Hookups in the library	277	14.36	3
Hookups in the main office	266	10.44	3
Hookups in the teachers' workroom	262	17.24*	3

Note. *Values significant at $p<.001$.

Table 4
Motivation for Learning to Use the Internet: Administrator and Teacher Responses

Survey Item: To what extent have the following motivated you to become an Internet user?	*Administrators N*	*Administrators % frequently/ regularly*	*Teachers N*	*Teachers % frequently/ regularly*
Personal interest and/or curiosity	164	73%	298	73%
Desire to learn new teaching tools	163	62%	298	59%
District office	161	43%	297	16%
Students	160	30%	297	37%

$p<.001$), in computer labs (χ^2 (3, N=275) = 18.34, $p<.001$), and in teacher workrooms (χ^2 (3, N=262) = 17.24, $p<.001$).

Learning to Use the Internet

Administrators. Not surprisingly, 93% of administrators reported that learning about the Internet had not been part of their educational preparation, but 43% reported that they were knowledgeable and skilled Internet users. Administrators were motivated to learn about the Internet by personal interest and/ or curiosity, by the desire to learn new teaching tools, and by the district office (see Table 4). They were most likely to report that they had learned about the Internet by trial and error; the next most frequently reported approaches to learning about the Internet were working with a designated staff technology specialist and/or working with a colleague (see Table 5). Respondents were asked to identify the approaches that were most effective in enhancing their learning to use the Internet (see Table 6). Trial and error was most frequently identified by administrators as effective approaches, followed by working with a colleague and working with a designated staff technology specialist. Using manuals or online tutorials were least frequently identified as effective approaches.

Teachers. More teachers than administrators reported some exposure to the Internet in their teacher education program (9% compared with 4% for administrators). More teachers than administrators (51% compared with 43%)

Table 5
Approaches to Learning to Use the Internet: Administrator and Teacher Responses

Survey Item: Which of the following approaches to learning about the Internet have you used?	*Administrators N*	*Administrators % frequently/ regularly*	*Teachers N*	*Teachers % frequently regularly*
Trial and error	164	77%	297	70%
Working with a designated staff technology specialist	162	35%	294	22%
Working with a colleague	162	34%	294	29%
Working with students	163	18%	295	37%
Working with manuals and/or on-line tutorials	164	13%	296	16%

Table 6
Effectiveness of Approaches to Learning to Use the Internet: Administrator and Teacher Responses

Survey Item: To what extent have these been effective in enhancing your learning to use the Internet?	*Administrators N*	*Administrators % frequently/ regularly*	*Teachers N*	*Teachers % frequently/ regularly*
Trial and error	164	60%	296	70%
Working with a colleague	162	43%	295	22%
Working with a designated technology specialist	162	43%	290	29%
School-level inservice(s)	163	35%	294	37%
District-level inservice(s)	162	36%	291	28%
Working with manuals and/or on-line tutorials	162	17%	295	19%

reported that they were knowledgeable and skilled Internet users. Teachers were motivated to learn about the Internet by personal interest and/or curiosity, by the desire to learn new teaching tools, and by their students (see Table 4). Teachers were most likely to report that they had learned about the Internet by trial and error, by working with a colleague, and/or by working with students (see Table 5). Learning to use the Internet for teachers was most frequently enhanced through trial and error, working with a colleague, and/or working with a designated staff technology specialist; the least frequently reported effective means of learning to use the Internet were district and school inservice and using manuals and online tutorials (see Table 6).

Using the Internet

Slightly more administrators than teachers indicated that the Internet is an important tool for teaching and learning. Administrators also were more likely than teachers to report making regular use of the Internet.

Using the Internet: Administrators

Most of the administrators indicated that they believed that the Internet is an important tool for teaching (86%) and for student learning (83%). Administrators were most likely to report using the Internet for communicating with other professionals by e-mail and for accessing district or ministry information (see Table 7). They were most likely to report using the Internet from 1-5 hours a week for their work at school; only a small portion of the administrator respondents reported using the Internet more than five hours a week, at school and at home (see Table 8). Only a few administrators were not using the Internet at school, but nearly half were not using it at home.

Using the Internet: Teachers

Most of the teacher respondents indicated that they believed that the Internet is an important tool for teaching (78%) and for student learning (76%). Teachers were most likely to report using the Internet for searching for lesson information on the Web, communicating with other professionals by e-mail, and finding lesson plans and/or teaching materials on the Web (see Table 7). They were most likely to report using the Internet less than an hour a week for

Table 7
Nature of Internet Use: Administrator and Teacher Responses

Survey Item: Indicate the extent to which you use the Internet.	*Administrators N*	*Administrators % frequently/ regularly*	*Teachers N*	*Teachers % frequently/ regularly*
To communicate with other professionals by e-mail	163	60%	292	30%
To access district level or ministry level information	161	45%	295	20%
To search for lesson information on the Web	-	-	296	33%
To find lesson plans and/or teaching materials on the Web	-	-	293	26%

their preparation and planning work at school and with students (see Table 8). About one quarter of teachers were not using the Internet for preparation and planning, and the same portion were not using the Internet with their students. Many of the teacher respondents were not using the Internet at home for preparation and planning. Only a small portion of the teacher respondents reported using the Internet more than five hours a week, at school for preparation and planning and with students. However, a few of the teachers reported using the Internet at home for preparation and planning more than five hours a week.

Teachers were asked to indicate the extent to which their students used the Internet for a variety of purposes. The most common activities that students were engaged in were: searching for information (38%), exploring for a topic (36%), communicating with others by e-mail (18%), and creating multimedia projects (12%). Fewer than 10% of the teachers reported that their students participated regularly in online chats or discussion groups, took virtual field trips, and/or viewed demonstrations on the Web.

Support for and Obstacles to Internet Use

Administrators were more likely than teachers to report that their school provided adequate support for learning to use the Internet and adequate technical support for using the Internet in teaching (see Table 9). Administrators were also more likely than teachers to report that their district provided adequate support for learning to use the Internet and adequate technical support for using the Internet in teaching.

Administrators were asked to indicate what support they gave for teachers' Internet use (see Table 10). Administrators reported that they facilitated teacher learning through providing access to staff inservice, designating a staff technology specialist, conducting staff inservice, providing financial support for teacher learning, and providing release time for teacher learning. They also provided other kinds of support such as ensuring hardware was maintained, allocating funds to upgrade hardware and/or software, and supporting the development of a school website. Most of teacher respondents viewed their administrators as supportive of Internet use (see Table 9).

Table 8
Extent of Internet Use: Administrator and Teacher Responses

Survey Item: How much time do you spend using the Internet?	*Administrators N*	*Administrators %*	*Teachers N*	*Teachers %*
For administrative work or for preparation and planning at school = none	160	7%	293	25%
For administrative work/preparation and planning at school <1 hour	160	31%	293	42%
For administrative work/preparation and planning at school = 1-5 hours	160	49%	293	29%
For administrative work/preparation and planning at school >5 hours	160	14%	293	4%
With students = none	-	-	286	26%
With students < 1 hour	-	-	286	37%
With students = 1-5 hours	-	-	286	31%
With students >5 hours	-	-	286	6%
At home using the Internet for administrative work, preparation, and planning = none	159	41%	293	43%
At home using the Internet for administrative work, preparation, and planning < 1 hour	159	26%	293	18%
At home using the Internet for administrative work, preparation and planning = 1-5 hours	159	28%	293	28%
At home using the Internet for admin work, preparation and planning >5 hours	159	4%	293	10%

Teachers were asked to indicate the extent to which various obstacles limited their use of the Internet (see Table 11). The most frequently reported obstacles were: limited time available for using the Internet, pressure to cover the curriculum, lack of school funds to purchase or upgrade hardware and/or software, and limited access to computers connected to the Internet. Problems related to the Internet itself or to their skills in using the Internet were seen as

Table 9
Adequacy of Support for Internet Use: Administrator and Teachers Responses

Survey Item: Support for Internet learning and use.	*Administrators N*	*Administrators % agree/ strongly agree*	*Teachers N*	*Teachers % agree/ strongly agree*
Adequate school support for learning about Internet	161	67%	287	55%
Adequate school technical support	161	59%	288	44%
Adequate district support for learning about Internet	162	53%	289	48%
Adequate district technical support	161	49%	286	32%

Table 10
Nature of Administrator Support for Teachers' Internet Use

Survey Item: Support for Internet learning and use.	*Administrators N*	*Administrators % regularly/frequently*
Providing access to staff inservice	162	62%
Designating a staff technology specialist	164	60%
Conducting staff inservice	164	40%
Providing funding for teacher learning	164	40%
Providing release time for teacher learning	162	33%
Ensuring hardware maintenance	162	85%
Allocating funds for upgrading hardware/software	163	81%
Supporting the development of a school website	163	45%

less limiting factors. Fewer than a quarter of the teacher respondents identified concerns related to relevance of information, reliability of information, the nature of information on the Internet, and limited skills in using search engines and/or search strategies on the Internet.

Comparisons of Teachers: Experienced and Novice Internet Users

The teacher participants were almost evenly divided between those who viewed themselves as knowledgeable and skilled Internet users (N=152, 51%) and those who did not. Contingency tables and chi-square analysis were used to compare their views and practices. There were no significant differences between experienced and novice Internet users in their views of the Internet as a teaching and learning tool or in their assessment of the adequacy of school support and district support for Internet use (see Table 12). Not surprisingly, those teachers who identified themselves as experienced users spent more time on the Internet for teaching preparation at school, at home, and with students. However, over half of the experienced teacher users had their students spend less than an hour per week using the Internet.

Significant differences were noted between experienced and novice Internet users in relation to their personal interest in the Internet (χ^2 (N=289) = 50.5, p<.001) and in their desire to learn about the Internet (χ^2 (2, N=289) = 37.3,

Table 11
Obstacles Limiting Teacher Use of the Internet

Survey Item: Obstacle or limiting factors for Internet use.	*Teachers N*	*Teachers % frequently/regularly*
Limited time available	297	66%
Pressure to cover the curriculum	294	42%
Lack of funding for upgrading hardware/software	293	41%
Limited access to Internet hookups	298	34%
Limited relevance of Internet information	296	23%
Low reliability of Internet information	291	21%
Nature of information on the Internet	296	20%
Limited Internet searching skills	296	21%

Table 12
Chi-Square Tests Comparing Internet Use Experienced and Novice Internet Users

Extent of Teachers' Internet Use	*none N (%)**	*<1 hour N (%)*	*1-5 hours N (%)*	*>5 hours N (%)*	χ^2	*df*
At school preparation					43.9*	3
Novice (*N*=137)	51 (37%)	64 (47%)	22 (16%)	0 (0%)		
Experienced (*N*=154)	22 (14%)	56 (36%)	63 (41%)	13 (8%)		
At home preparation					48.3*	3
Novice (*N*=137)	86 (63%)	25 (18%)	19 (14%)	7 (5%)		
Experienced (*N*=154)	40 (26%)	28 (18%)	64 (42%)	22 (14%)		
Use with students					35.5*	3
Novice (*N*=133)	49 (37%)	57 (43%)	25 (19%)	2 (2%)		
Experienced (*N*=151)	23 (15%)	50 (33%)	62 (41%)	16 (11%)		

Note. *Values significant at $p<.001$.

$p<.001$). Significant differences were also noted in how they used the Internet. For example, teachers who were experienced Internet users were more likely to search for lesson information and teaching materials on the Web ($\chi^2(2, N=288) = 55.7$, $p<.001$) and more likely to engage their students in searching for information on the Web (χ^2 (2, $N=289$) = 25.5, $p<.001$), to take their students on virtual field trips (χ^2 (2, $N=285$) = 21.8, $p<.001$), to have their students communicate with others by e-mail (χ^2 (2, $N=286$) = 20.0, $p<.001$), and to engage their students in creating multimedia projects (χ^2 (2, $N=286$) = 30.1, $p<.001$). Beyond personal interest and desire to learn about the Internet, there were no significant differences in the factors that motivated teachers, either novice or experienced Internet users, to learn to use the Internet.

Discussion

This survey supports and validates the information obtained in the two previous qualitative studies (case studies and collaborative research partnerships). The low response rate and simple sampling scheme limit the generalizability of the findings to some extent, but comparisons of demographic variables from the survey participants with published statistics from Alberta Education suggest that the sample is comparable to the population of teachers and schools in Alberta. Differences found in this sample compared with the population statistics available are minimal (Alberta Education, 1997b). Despite the similarities between this sample and the population, we recognize the potential limitations with regard to generalizations of these findings. A randomized stratified sampling matrix with extensive follow-up to ensure a high response rate are recommended for future studies.

Overall, most administrators and teachers in Alberta schools who responded to this survey felt positive toward the Internet and believed that it is an important teaching and learning tool. They were interested in the Internet and wanted to learn to use it as a tool for teaching. More administrators than teachers saw the Internet as an important tool for teaching and learning. This difference could be accounted for in several ways. At the time of the survey,

administrators may have been more aware than teachers of the pending curriculum and policy directives from the provincial ministry of education. Another explanation may be that administrators are less aware than teachers of the complexity of introducing innovation into the delicate balance of the classroom environment. As well, administrators were using the Internet, particularly e-mail, more than were classroom teachers. This may reflect the administrators' privileged position in the school relative to Internet access, their comparative freedom from scheduling, and the amount of unscheduled time they have available during a school day. This may also reflect district and ministry expectations that principals be the conduit for educational information.

The survey data suggest that in Alberta schools learning about the Internet is a highly individualized activity that takes place on the edges of teaching lives. About half of the teachers and one third of the administrators felt that they were not getting adequate support from their district for learning about the Internet and for technical support. However, most teachers saw their school administration as being supportive of Internet use, and administrators who were experienced Internet users were more likely to present staff inservices. This would suggest that having an administrator who strongly encourages teacher interest in learning about and using the Internet is a critical factor for teacher motivation.

Many administrators and teachers were exploring the Internet, primarily through trial and error, and they saw lack of time as the largest limiting factor to their use of the Internet. Respondents most frequently rated trial and error, followed by working with other colleagues or working with a designated staff technology specialist, as effective ways of learning about the Internet. Another perspective emerged when the responses of experienced and novice Internet users were compared. Novice users were less likely than experienced users to find trial and error an effective way to learn. This finding is a reminder of the limitations of some of the web-based, self-directed learning programs. There has been much hype about learning to use technology via technology, using websites that offer training possibilities, but this type of learning is not very welcoming to novices. New users need to develop a certain level of technological knowledge and skill before they feel comfortable enough to begin to access and use these sites. As well, the least frequently reported means of enhancing Internet learning was online tutorials. This was true for both administrators and teachers and for both experienced and novice Internet users.

Respondents were less likely than expected to report that they learned about the Internet through attending district or school inservices. About one third of the teachers and administrators had never or rarely accessed school inservice related to the Internet. Of the 25% of administrators who reported learning about the Internet through school or district inservices, only about 35% rated such inservices as being effective in enhancing their learning about the Internet. Of the 20% of teachers who reported learning through school or district inservices, only about 25% rated these inservices as effective in enhancing their learning. The survey questions did not ask how often inservices were actually available to school staffs, whether they were offered in school time or

outside of school hours, and whether such inservices were mandatory or optional.

There are a number of possible ways of explaining the reported ineffectiveness of inservicing. Anecdotal evidence gathered from conversations with teachers in the authors' graduate courses suggests that school and district inservices are often too intensive in terms of the amount of information and the pacing of delivery. These teachers report that they experience such inservices as information overload. The situation is exacerbated by the lack of opportunity for teachers to practice the skills and/or apply the strategies being demonstrated subsequent to inservice sessions. A critical aspect of inservice success is the opportunity to practice the new skills, but teachers rarely have the time or opportunity to practice their new skills within a time frame conducive to retention and/or development of those skills. Too often inservices do not include sufficient practice and discussion time, and opportunities for practice and discussion are limited when teachers return to their busy, often hectic, lives.

Teacher and student access to appropriate hardware has an impact on teacher and student use of the technology. The survey questions asked about the level of student access and about the location of hookups. Most schools had Internet access in computer labs or in the school library. Fewer than half of the teacher respondents had Internet access in their classrooms. Almost half of the schools had high levels of student access to Internet hookups (10 or fewer students per hookup) but only one third of the teachers reported engaging their students in Internet use more than one hour per week. These low levels of Internet use by students are unlikely to result in the development of the kind of sophisticated information skills that are expected for Alberta students, based on the provincial curriculum document *Learner Outcomes in Information and Communication Technology* (Alberta Education, 1997a).

The Internet is a complex and challenging information environment. Other studies have indicated that teachers and their students have a great deal of difficulty in navigating the Internet and in finding reliable and curriculum-relevant information. The teacher participants in the case studies reported earlier (Gibson & Oberg, 1997) identified the variable quality of Internet information as well as their lack of effective Internet search strategies as important instructional concerns. However, survey respondents saw these as the least of their concerns. For them the largest concerns related to time to learn to use the Internet, time to cover the curriculum, and money for more computers. This suggests that many of the respondents are in the early stages of technology implementation. Their concerns are at the management level, that is, how to use the technology itself, rather than how to integrate the Internet into the curriculum and how to use it to benefit student learning.

Conclusion

Mandatory implementation of the information and communication technology learner outcomes in Alberta is scheduled for the Year 2000. Integration of the Internet into teaching and learning is one of the expectations for this curriculum program. If educational leaders and decision-makers are serious about this expectation, the issue of teacher learning must be considered care-

fully. The results of our survey and case studies suggest that teachers need time to learn the intricacies of the Internet, but time alone will not address all the learning issues. Guided exploration, collegial sharing of integration strategies, and one-on-one support from information and communication technology specialists are some of the approaches that will maximize teacher learning time. Inservice programs must be carefully planned to allow for hands-on practice and discussion, both during and following the sessions. Administrator and district support for learning is crucial, as is providing easy access to the technology. However, ready access to technology is a necessary but not sufficient condition for teacher learning and for increased Internet use with students. As one of the principals in our first set of case studies stated,

> We can have all the technology in the world but unless we know how to use it and feel comfortable, and have someone who supports us and guides and encourages us and excites us to want to use it, it's not going to get used.

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